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ABSTRACT

Consistent with the principles of the Connecticut Common Core of Learning, this competency-based curriculum guide for drafting provides a reference guide for educators to research and prepare for teaching the field of drafting communications. The guide contains 44 units in three levels. The introductory level covers the following topics: introduction, lettering, print reading, sketching, drafting tools, introduction to computer-aided drafting, geometric construction, single-view layouts, orthographic projection, dimensioning, sectional views, pictorials-isometrics and obliques, auxiliaries, drawing reproduction and storage, graphs and charts, and developments. At the intermediate level, topics are organized under two headings, mechanical and architectural. The mechanical section covers drafting tools, sketching, dimensioning and tolerancing, orthographic projection, sectioning, auxiliaries, pictorial-isometric and oblique views, fasteners, mechanical drive systems, architectural--floor plan design, frame member sizing, foundation configuration, stair layout, window and door schedules, sectioning, elevations, pictorials-perspectives, plot plan, and energy efficiency. The advanced level covers dimensions and tolerancing, threads and fasteners, production illustration, pictorials-perspectives, revolutions, developments and intersectings, descriptive geometry, specialized fields of drafting, and modeling and model making. Units list objectives, learning activities, resources needed, and competency tests. General information about the technology education program is also provided. (KC)

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Technology Education Curriculum Guide

Connecticut State Department of Education
Division of Vocational, Technical, and Adult Education

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Drafting Communications

CURRICULUM GUIDE
FOR
DRAFTING COMMUNICATION
IN
TECHNOLOGY EDUCATION

Prepared for
State Department of Education
Division of Vocational, Technical and Adult Education

Prepared by
Connecticut Industrial Technology Education Association

All opinions expressed reflect the views of the
authors and are not necessarily those of
the State Department of Education.

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CONNECTICUT TECHNOLOGY EDUCATION CURRICULUM COMMITTEE
FOR
DRAFTING COMMUNICATION TECHNOLOGY IN EDUCATION

John P. Sabulis, Chairperson
Drafting Instructor
Ansonia High School

Raymond Clark
Education Director
Porter & Chester Institute

James McGuire
Department Chairperson
Technology Education
Ledyard High School

Walter Mills
Drafting Instructor
Hamden High School

Nick Savin
Drafting Instructor
Westport Public Schools

Robert Shoham
President
Plasticoid Manufacturing Co.

David Sweet
Drafting Instructor
Killingly High School

Abbott White
Executive Director
CT Technology Ed. Assoc.

David M. Mordavsky
Technology Ed. Consultant
State Dept. of Education

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BUREAU OF VOCATIONAL SERVICES

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INTRODUCTION TO DRAFTING GUIDE

This guide has been prepared as a working document for drafting communications teachers and coordinators and is meant to be an open-ended instrument. This document permits the insertion of materials which individual teachers have found to be effective supplements to the drafting curriculum.

The intent of this course outline is to highlight units at each level, introductory, intermediate and advanced, which should be covered in the field of drafting. The sections included in each unit list performance objectives and learning experiences that are coordinated with competencies that each student should master upon completion.

Computer-Aided Drafting (CAD) should be included throughout the curriculum as a very powerful tool in the drafting industry. A specific unit has been developed to explore and encourage CAD's potential as an additional drawing tool. This unit is included at the introductory level. Also included is a separate statement familiarizing teachers with the basic components of a CAD system and concepts of its operation.

Connecticut Common Core of Learning

This competency-based curriculum guide for Drafting Communications is meant to be supportive of and in harmony with the Connecticut Common Core of Learning document developed in 1987. As drafting is one of the earliest stages of industrial or technological thought, it should be considered the common thread that links a majority of technological processes.

The study of drafting communications by its very nature develops the following Common Core skills:

Attributes and Attitudes - positive self-concept, motivation, responsibility, intellectual curiosity, interpersonal relations, moral and ethical values, reading, writing, quantitative skills, reasoning and problem solving, and learning skills.

Understanding and Applications - careers and vocations, mathematics, and science and technology.

The end result of this curriculum should be a greater understanding of Drafting Communication and its associated careers, skills, mathematics, sciences, and other related technologies.

TECHNOLOGY EDUCATION SCOPE AND SEQUENCE

Technology Education learning experiences are sequential, beginning in the lowest grades and continuing through adult and higher education. As an integral part of the total educational program, Technology Education is designed to meet students' needs as they relate to a modern technological society. Through manipulative and research experiences, with a variety of tools, machines, processes and products of industry, students develop an awareness of how industry and its many components function.

A comprehensive Technology Education program will provide for a sequence of courses in industrial areas. These include, but are not limited to:

- Communication Technology
 - Drafting
 - Graphic Communications
- Construction Technology
 - Industrial Ceramics
 - Woods
 - Electricity/Electronics
- Manufacturing Technology
 - Metals
 - Plastics
- Transportation Technology
 - Power/Energy

The objectives of Technology Education are:

- To develop an insight and understanding of industry, its place in our society, and the free enterprise system;
- To develop problem solving skills related to the materials, tools, processes and products of industry;
- To provide for a degree of skill development through a series of sequential courses in common industrial areas with vocational emphasis at the advanced levels;
- To develop knowledge of the tools, machines, materials, and processes of industry through their practical and safe use;
- To develop an appreciation of good design and craftsmanship;

To develop an understanding of industrial and technological career opportunities and their requirements;

To develop those traits which will help students obtain and maintain employment;

To develop consumerism regarding the goods and services of industry;

To discover avocational and recreational interests;

To understand the effects of industry and civilization upon the environment.

The following sequential phases represent a range of Technology Education activities from kindergarten through adulthood. Reference is made to grade level to assist local education agencies (LEA's) in planning. It is understood that the manner in which grades are organized depends on local situations.

I. Self-Awareness (grades K-6)

Technology Education at this level is designed to familiarize students with the many kinds of work people do and the tools and materials they use. It is at the elementary level that Technology Education activities are used to enhance basic skills and understandings in all curriculum areas by providing relative hands-on experiences.

II. Technology Exploration (grades 7 & 8)

Technology Education at the middle school/jr. high school level is designed to foster the development of a strong foundation in the concepts, skills, knowledge, and attitudes regarding not only the technical but also the related and social aspects of general education.

Technology Education experiences at this level are exploratory in nature. The program provides students with the opportunity to develop a better understanding of their interests, abilities, and aspirations. Consumer knowledge as it relates to industrial products and processes is an inherent part of these activities. A broad exploratory Technology Education program at the middle school/jr. high school level allows individual student's interests to become focused, enabling greater concentration at the senior high level.

III. Occupational Orientation (grades 9 & 10)

Technology Education at this level emphasizes occupational orientation. It is here that the transition from middle school/jr. high school exploratory experiences to specialization at the upper levels is made. Students may explore in greater depth a wider variety of areas, evaluate their performance, aptitudes and interests and begin to formulate career plans.

IV. Technology Specialization (grades 11 & 12)

At this level, students are provided the opportunity to specialize in one or more occupational areas and to develop pre-vocational skills. Training at this level should prepare students to maximize their career options after high school.

This level should also assist individuals in making informed and meaningful occupational choices and/or prepare them for entry into advanced trade and industrial or technical education programs.

V. Adult, Continuing, and High Education Technology

Education programs are designed for adults and out-of-school youth. These programs are avocational or vocational in nature depending upon the needs of the individual and the demands of society.

Specific Guidelines for Technology Education

Grade Level

7 - 12 and adult

Selection of Students

Open to all students who can profit from instruction, and work safely in a Lab/Shop situation.

Length of Program

Level One (Exploratory) grades seven (7) and eight (8) - Lab/Shop classes meet a minimum of 60 hours per year. Lab/Shop periods must be of at least 40 continuous minutes and should not exceed 60 minutes.

Level Two (Occupational Orientation) grades nine (9) through twelve (12), or grades ten (10) through twelve (12) - students electing Level Two Technology Education courses must have the opportunity to participate in a minimum of 225 minutes of Lab/Shop activities per week, per semester. Daily Lab/Shop period must be of at least 45 continuous minutes and should not exceed 60 minutes.

Level Three & Four (Specialization and Pre-Vocational) grades eleven (11) and twelve (12). Students who elect Level III & IV Technology Education courses must have a minimum of 450 minutes per week, per year of Lab/Shop activities. Daily Lab/Shop periods must be of at least 90 continuous minutes.

The definition of a year is a minimum of 180-day school days. A semester is 90 continuous school days.

Pre-Requisites

Successful completion of Level Two course prior to participating in Level Three. Successful completion of Level Three course prior to Level Four.

Enrollments

Based on Lab/Shop size and facilities, 16 students per class maximum in Lab/Shop areas, such as electronics, and 20 students per class in drafting. The recommended and minimum square footage are as follows:

	Recommended		Minimum	
Jr. & Sr. H.School	s.f./pupil station	Net total s.f. area	s.f./pupil station	Net Total s.f. area
Drafting (including storage)	48 sf	1200 sf	40 sf	1000 sf
T.E. Jr. H.S. Level One (including storage)	100 sf	2500 sf	82 sf	2050 sf
T.E. Sr. H.S. Levels Two, Three (including storage)	144 sf	3600 sf	120 sf	3000 sf

A classroom should be made available for related study, adjacent to the Shop/Lab areas. All facilities must comply with OSHA regulations.

Teachers' Schedule

Technology Education contact hours for a full-time instructor should comprise 70% to 80% of their school week, with 20% to 30% of their time spent in Technology Education related non-teaching duties, such as maintenance and preparation of Technology Education materials.

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Grade Level

7 - 12 and adult

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Equipment

All equipment must be in safe operating condition and conform to all federal, state, and local standards. Equipment must:

- A. Be applicable to the level being taught, i.e., size, capacity, quantity, and necessity.
- B. Enhance the program level and be similar to that found in industry.
- C. Take into consideration: occupational education, consumer competency, leisure time activity, and environmental awareness.

Evaluation

Continuous evaluation by students, teachers, school, vocational, advisory committee, and state. Evaluation results must become an integral part of program development and improvement.

School Credit

Equal to other academic credit granted for similar periods of time and activities.

Youth Organizations

It is recommended that the American Industrial Arts Student Association (AIASA) be an integral part of the curriculum.

Teacher Certification

Instructors shall meet the minimum standards for Technology Education teachers provisional certification as outlined in the "Rules and Regulations Concerning State Teacher Certification" section 10-146-21 and section 10-146-22.

Standard certification requires three (3) years of teaching under a provisional certificate, the last two (2) years consecutive and a master's degree or thirty (30) semester hours, consisting of a planned program at an approved institution of higher learning and an individual program, mutually determined and approved by teacher and supervising agent.

Teachers of Technology Education to be funded through the Vocational Education Acts must comply with section 10-146-22 above, have one (10) year of appropriate occupational experience and complete Principles of Vocational Education, a three (3) semester hour Vocational-Technical Education course.

Sex Stereotyping

Existing activities and future plans must show evidence of actions directed toward the elimination of sex stereotyping, including continual effort to attract females to elective Technology Education courses traditionally chosen by males. Technology Education courses which are required for any students at a particular level must be required of all students, male and female.

How To Use This Guide To Drafting Communication

This guide was developed to help the Technology Educator have a central source of information. It is to be used as a reference guide for educators to research and prepare for teaching the ever changing field of Drafting Communication.

This guide and the sequence of topics is not meant to suggest a set three-level program (introductory, intermediate, and advanced) for every school situation. Instructors will extract from this document that information which can realistically be accomplished within the time constraints of their individual school program. This guide was not written with the intent of being used as a daily lesson plan, rather as a flexible source of information.

The authors of the Institute for Teaching & Learning 1988-1989 Catalog Overview, believe that, "Change may be the only certainty in our children's lives. Technological advancement and the challenges brought on by social, economic, and political change will make their lives more complex than those of any previous generation. Our children must be able to adapt and succeed today and in the future..."¹ With this in mind, the Educator should supplement the units in this guide, with Activity orientated assignments. These activities should reflect the new trends in technology, and be integrated into the everyday learning experience of the student.

It should be noted that there are no time lines or grade levels given for each unit. The committee feels that this should be left up to the local municipal school district. Each municipality decides the involvement of Technology Education within its school district. Local educators should be able to decide what and how Drafting Communication is to be taught within their classroom. This is determined by the equipment and text available.

¹ CT. Continuum State Dept. of Ed. 1988 p.1

CADD: Computer-Aided Design/Drafting

A. Concepts

1. Statement: CADD is the organized use of a computer, CRT monitor, input device, and CAD software to perform drafting and design tasks.

These tasks can range from the simple and repetitive to the complex. Since all drafting skills can be reduced to the use of lines, arcs, points, symbols, and text, most CADD systems deal with these primitives and the many ways of grouping, reusing, and manipulating these items. The primitives are used to create more complex drawings through the use of any number of input devices to form the drawing on the screen. Through the use of the software, the drawing can be modified, stored, or dumped to a plotter to produce a hardcopy. PC Magazine of July 1984 stated that "CAD programs are to images what word processors are to words: You use them to create, edit, and make hardcopy, but the medium is pictures." CAD can be thought of as image processing.

2. Computer use in Design and Drafting
 - a) Developing simple drawings through the use of primitives
 - b) Using groups and symbols to create drawings
 - c) Creating your own symbols - any commonly used drawing or part of a drawing can be grouped and reused in other parts of a drawing or other drawings to simplify repetitive tasks
 - d) Modeling and testing in 3-D systems
 - e) Increased accuracy and repeatability of any task
3. Direction of the industry
 - a) More systems hitting the market every day
 - b) Steady increase in use by industry as systems become more versatile and less costly

4. Advantages to industry
 - a) More productivity in the long run
 - b) Ease of editing existing drawings
 - c) Reduced space for drawing storage
 - d) Uniform drawing quality
 - e) Increased quality of reproductions
 - f) Reduced set-up time on new drawings
 - g) Increased ability to retrieve and use data from drawings for testing and design
5. The role of the school system in implementation
 - a) Student exposure
 - b) Familiarity with terms
 - c) Familiarity with new technology
 - d) Increased student awareness of the job opportunities available in the field of Drafting, Design, and CAD

B. Goals

1. Familiarity with concepts
2. Develop new approach to design and drafting - CAD systems are not just electronic pencils
3. Develop familiarity with hardware and software
 - a) Develop computer awareness
 - 1) Keyboard skills
 - 2) Familiarity with different input devices
 - 3) Computer storage methods
 - b) Creating and editing capabilities of CAD
 - c) Drawing and image storage capabilities
 - d) Hardcopy production
4. Understand connections with other areas
 - a) Testing and research
 - b) CAM/CIM

C. Applications

1. Drafting
 - a) View development
 - b) Pictorials
 - c) Mechanical
 - d) Architectural
2. Design
 - a) Definition from Webster's: "to conceive or plan out in the mind; to conceive or draw the plans for; a sketch or plan showing the main features of something to be executed."
 - b) 2-d
 - c) 2 1/2-d; (3-D representation on a 2-D screen)
 - d) 3-d; rotatable and modeled images on the screen having true three-dimensional characteristics, length, height, and width.
 - e) Symbol libraries - a resource of commonly used drawing parts which may be used to create new drawings or edit existing drawings.
3. Relation to manufacturing and other areas
 - a) Drawing reproduction, revision, and storage - Drawings may be reproduced or revised from memory at any time. It is very possible to recall a drawing, revise some portion of the work, and if the revisions prove to be unsatisfactory, to restore the drawing to its original state with very little effort.
 - b) The CAM connection - There are systems presently being developed that will make the CAM connection the direct link between design and manufacturing. Whether these systems will prove functional in the industrial setting is still to be proven.
 - c) Electronic schematic and printed circuit design
 - d) Testing
 - 1) Materials testing
 - 2) Load and engineering testing
 - 3) Product evaluation testing
4. Databases
 - a) Bill of materials
 - b) Pattern, shape, symbol files (libraries)
 - c) IGES

D. Hardware

1. Micro to mainframe
 - a) Turn-key systems - PC-based CAD systems
 - b) Networked systems - Multi-station units which are interconnected and use the same source of memory.
 - 1) Advantages - Single storage and library facility for the shared use of data, smaller work stations per operator.
 - 2) Disadvantages - More chance of system down-time, slower access time for data, most often more costly than PC-based CAD.
2. Micro-based system details/CAD station
 - a) Base computer with storage medium (media)
 - b) Input devices
 - 1) Keyboard - typing-keystroke input of information
 - 2) Digitizer (2-d, 3-d) many different sizes to fit the application, allow for the direct transfer of points from existing drawings to CAD medium
 - 3) Mouse - light sensitive, roller ball
 - 4) Light pen - direct screen touching to pick points and commands
 - 5) Joy stick
 - 6) Thumb and finger wheel - one wheel for horizontal (X-axis) and one for vertical (y-axis)
 - 7) Optical scan video camera - direct input of existing drawing and other graphic matter through a video camera and scanning unit.
 - c) Output devices
 - 1) Plotter
 - 2) Graphics printer - dot-matrix or laser
 - 3) Photographic reproduction - presentation slides directly from screen image

E. Software

1. Generic vs. Application specific

- a) Multi-purpose software capable of functioning in any drafting and design situation, usually general drafting work
- b) Application specific
 - 1) Mechanical
 - 2) Architectural
 - 3) Printed circuit and electronic
 - 4) Other applications - Most systems will function and perform most drafting tasks but some of the software have advantages that make them more suitable for specific areas.

2. Capabilities

The following is a list of capabilities which a basic CADD system should possess.

a) Configuration:

To be able to set the area represented on the video monitor to any appropriate size for the task at hand. These sizes should be easily scalable to the available plot size to be used.

b) Grid Generation:

Grids are used to aid the layout of a drawing and should have the ability to be altered to any desired size at any time during the drawing process. The grid dots should appear on the screen but not effect the final plot. Grids should also have the ability to be turned off and on as desired.

c) Use of snap:

Snap is the ability to regulate the movement of the cursor on the screen in increments which may be set by the user. These increments may be the same as the grid spacing or may be set smaller. The user may desire one inch grid spacing with .25 snap spacing to work with four increments or stops between each dot on the grid.

d) Draw using primitives:

Drawings should have the ability to be generated by the use of lines, arcs, and circles. All drawings can be boiled down to these primitives or entities. There may be other modifications of these three types of entities, such as wide lines called traces or different line styles needed to complete most drafting tasks, but these still reflect back to the three original primitives.

e) Three methods of input:

Absolute - This method uses the keyboard to type in the actual X and Y coordinates desired usually separated by a comma. For example: "3.5,15" specifies a point with an X coordinate of 3.5 and a Y coordinate of 15 units.

Relative - This method also uses the keyboard to type in a distance and direction from a previously picked point. The method of keystroking these facts in may vary from software to software but will accomplish the same thing. For example: When using AutoCAD, typing "@2.5<45" will cause the cursor to move 2.5 units at 45 degrees.

Pointing devices - Each system uses a different kind of pointing device but it must be understood that they all do the same thing. They are used to move the cursor on the screen and pick points which are used in the generation of any drawing. This method is by far the fastest, but the other methods may be used when accuracy is most critical.

f) Generation of text:

Text should have the ability to be generated in at least four methods and at any desired size. The four methods most commonly used are left-justified, right-justified, centered and aligned. Left-justified is the method used to pick a starting point for a text entry and have the entry extended to the right. The right-justify method will allow the operator to pick an end point for the desired text and the text will be filled in to the right of this point. The centered method will allow the operator to pick the desired point where the center of the text entry will be placed and the line of text will extend in both directions. The previous three methods require the operator to select the desired height of the text entries. The fourth method, the aligned method, does not require this input. The operator simply selects the starting point and the end point for the text entry and types in the desired text. The system will then compute the length of the line of text and fit it between the two end points. The height of the text will be determined by the length of the space provided.

g) Grouping entities:

The system should be able to group primitives or entities for repeated use as in the case of symbols or repeatable portions of drawings. These groups should have the ability to be scaled up or down and also be allowed to be broken apart or unnested for later modification. The ability to form and use groups may be one of the bigger advantages in any of the better CADD systems. A system without this capability may cause the operator to spend an inordinate amount of time recreating what has been created before. The ability to create symbols and symbol libraries is directly connected to this grouping ability.

h) Modifying a drawing:

Drawings should be able to be altered through different methods as the need arises. These treatments should be able to be performed on individual entities by selecting each entity desired, by the window method, where all desired objects are included in a window on the screen or by the system selecting the last object drawn. The following is a list of common edit or modify functions.

Erase - The ability to edit the drawing by deleting entities from the screen. Once removed, these entities may or may not be recalled depending on which software is being used. AutoCAD has a command called "oops" which will recall all of the entities erased in the last erase command.

Move - Entities or groups should have the ability to be moved on the screen by picking a distance and a direction.

Copy - Entities or groups should have the ability to be copied, making exact duplicates at other positions on the screen.

Array - This is the ability to duplicate an object or group in a circular or rectangular fashion any number of times. This command would be used to make rows and columns of like objects or to rotate the same object about a center point.

Mirror - This command allows the operator to create a mirror image of an object where the object is the same on both sides of a horizontal or vertical line. This allows the operator to draw only half or in some cases, one quarter of an object.

Break - This command allows the operator to remove a section of a primitive. This section may be at the end of a line or arc or be in the middle of a line, arc or circle.

A note about the Edit commands:

The power of any CADD system can be determined by the extents of the modification or edit commands. This is where the real power of any system lies. If things cannot be erased, moved, copied, etc. to alter the drawing to the operator's needs and must be erased and redrawn, then the system is no more than an electric, high-tech pencil probably with more disadvantages than advantages.

1) Display Options:

The operator should be able to select his/her point of view as he/she works through any drawing. The operator must be able to zoom in or out as he/she desires. The magnification of the drawing on the screen will allow the operator to be very precise in the selection of the desired points he/she wishes to use. This ability may also be called window in or out depending on the software package being used.

j) Geometric Generation:

Most good systems will perform round and fillet operations as desired by the operator. The desired radius will be inserted by the operator and the system will perform the operation automatically when the two lines to be rounded are selected.

Most systems will also work with solid shapes and will fill these shapes on the screen. Another important task is the ability to hatch in a sectioned area using a varied number of sections symbols.

k) Layers:

CADD systems should be able to work on any number of different layers. These layers may be used to place different line types on a drawing or different type objects into a drawing as in architecture where a different layer would be used for the electrical plan or the plumbing plan overlaid on top of the original floor plan. Layers must have the ability to be selected and turned on and off at will. If organized properly, this capability can be very useful in the development of complex drawings. Layers are sometimes referred to as levels.

l) Dimensions:

Most good systems will generate dimensions for a drawing at some level of automation. Some systems may require the operator to select the object to be dimensioned and it will compute the size of the object and the position the dimension automatically. Other systems will prompt the operator for the beginning and end of a distance and the position of the finished dimension. The system will then compute the distance and place the completed dimension on the screen. This is commonly referred to as semi-automatic dimensioning.

m) Plotting:

The final result of any system is to produce hardcopy. To complete the CADD process, the operator must be able to transfer what is on the screen to a plotter or printer to produce a copy of the drawing on the screen. This can be accomplished by means of a single or multi-pen plotter or a dot-matrix or laser printer. All systems will have these capabilities and these do not directly effect the methods by which a drawing is originally developed.

As in the varied amount of systems of the market, one must realize and understand that each system has its advantages and disadvantages and will not be all things to all people and applications. Each system will stand on its own merits and must be considered as an individual. When playing the comparison game and shopping around, you will begin to realize that comparing CADD systems on a capability and cost basis is like comparing apples and oranges. The final choice is the correct choice for your application.

3. Evaluation: What can it do? What can't it do?

Most currently offered systems have the same basic capabilities and will suit the comprehensive high school Industrial Arts Curriculum for Drafting. The more powerful the editing commands are, the more powerful the system is generally thought to be. When shopping for a system, it may be most important to ask, "What won't the system do?" rather than "What will the system do?".

UNIT - INTRODUCTION

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. explain how drafting fits into the working world and grasp the importance of drawing as it pertains to the production of and object;
2. identify the different applications of drafting such as mechanical, architectural, and others;
3. give career examples and be aware of the job opportunities that will be open to him or her if they pursue this field;
4. to demonstrate an understanding of how a set of accepted standards apply to the different areas of drafting;
5. explain the advantages of how a CAD system relates to drafting and know how the system works.

LEARNING ACTIVITIES

Lecture/demonstration/student performance/slide shows; video shows/collect articles; examples.

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment and supplies
CAD equipment (hardware and software)
Video tapes and VCR and monitor
Slide shows
Instruction Book

COMPETENCY TESTS

The student will demonstrate the following competency levels:

OBJECTIVE #1

Give examples of how drafting fits into the working world.

OBJECTIVE #2

Given sample drawings, the student will identify the different types.

OBJECTIVE #3

The student will create a list of career opportunities in the drafting field.

OBJECTIVE #4

The student will make a list of reasons why standards are used.

OBJECTIVE #5

The student will list examples of the advantages of CAD applications in industry.

UNIT - LETTERING

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. identify the different methods of creating alpha/numeric symbols;
2. create freehand alpha and numeric symbols which will meet acceptable industrial standards;
3. demonstrate the ability to label a drawing by use of a lettering template;
4. describe the advantages of CAD-generated lettering.

LEARNING ACTIVITIES

Demonstration/text/student performance

AVAILABLE RESOURCES NEEDED

Pencils
Paper
Templates
Lettering devices such as Kroy, Wrico
Transfer letters
CAD system

COMPETENCY TESTS

The student will demonstrate the following competency levels:

OBJECTIVE #1

Given the appropriate drafting resources, the student will identify the different methods of creating alpha/numeric symbols when given samples of each.

OBJECTIVE #2

Given the appropriate drafting resources, the student will be able to print a set of freehand symbols to acceptable industry standards.

OBJECTIVE #3

Given the appropriate drafting resources, the student will be able to label a drawing by using a lettering template.

OBJECTIVE #4

Given the appropriate drafting resources, the student will create a list of advantages of CAD-generated lettering.

UNIT - PRINT READING

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. identify different kinds of lines used in drafting and explain their uses;
2. identify the different views used to represent an object;
3. identify aspects about an object by reading the dimensions attached to the drawing, and retrieving facts from the title and revision blocks;
4. identify features of an object from a print;
5. identify different types of dimensions from a print;
6. identify standardized symbols on a sample print.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Print reading textbooks
Drafting text
Sample prints from industry

COMPETENCY TESTS

The student will demonstrate the following competency levels:

OBJECTIVE #1

Identify a set of highlighted lines by name and explain the use of each line as it is used on that print.

OBJECTIVE #2

Identify the different views illustrated on the sample print.

OBJECTIVE #3-A

Identify a standard title block and describe on what type of drawing it would most appropriately be used.

OBJECTIVE #3-B

Identify the revision block and describe the information listed in the block and how it relates to the drawing.

OBJECTIVE #3-C

Identify and list facts about a sample print by doing a take off of the highlighted details of the sample. This process can be in several formats including multiple choice or fill in the blank.

OBJECTIVE #4

Identify different shapes and surfaces of an object as it relates to a pictorial view of the sample object or print.

OBJECTIVE #5

Identify the difference between size and location dimensions of a sample print and also retrieve factual information from the sample as related to size and location of details of the object.

OBJECTIVE #6

Identify standardized symbols used on the sample print and give the meaning of the highlighted symbols as they relate to the sample.

UNIT - SKETCHING

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. list two reasons for the importance of sketching and provide examples;
2. draw horizontal, vertical, inclined, and curved lines without the aid of drafting tools;
3. distinguish between scale and proportion;
4. sketch three view and pictorial drawings using appropriate lined graph and isometric grid paper;
5. sketch proportionate three view drawings from pictorial drawings without the aid of graph paper.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Pencils
White paper
Graph paper, ISO grid paper
Drafting instruments
Texts

COMPETENCY TESTS

The student will demonstrate the following competency levels:

OBJECTIVE #1

Students will list the importance of sketching and provide examples.

OBJECTIVE #2

Given the appropriate resources students will demonstrate their ability to sketch horizontal, vertical, inclined and curved lines and geometric shapes.

OBJECTIVE #3

Following their reading of the sketching chapter, students will demonstrate the difference between scale and proportion by sketching a proportioned drawing without the use of a ruler and sketching a scaled drawing without the use of a ruler.

OBJECTIVE #4

Given the appropriate resources, students will sketch three view drawings from pictorial drawings provided on grid paper.

OBJECTIVE #5

Given the appropriate resources, students will sketch proportioned three view and pictorial drawings from examples provided.

UNIT - DRAFTING TOOLS

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to identify and properly use the drafting tools used to draw lines;
2. demonstrate the ability to identify and properly use the drafting tools used to draw circles and arcs;
3. demonstrate the ability to identify and properly use the drafting tools used to draw irregular curves;
4. demonstrate the ability to identify and properly use the drafting tools used to measure and transfer/copy measurements.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting supply catalogs
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency levels:

OBJECTIVE #1

Identify and properly use tools to draw lines.

OBJECTIVE #2

Identify and properly use tools to draw arcs and circles.

OBJECTIVE #3

Identify and properly use tools to draw irregular curves.

OBJECTIVE #4

Demonstrate the ability to identify and use measuring tools to make measurements and to transfer/copy measurements.

UNIT - INTRODUCTION TO COMPUTER-AIDED DRAFTING

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. to identify the basic hardware components used to run a Computer-Aided Drafting system;
2. to demonstrate the ability to boot-up and load a CAD program;
3. to demonstrate the ability to develop a simple drawing on CAD;
4. to demonstrate the ability to save and end a CAD software program;
5. to demonstrate the ability to accomplish basic file maintenance on a floppy diskette.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Texts and reference materials

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify and describe the basic hardware components used to run CAD systems.

OBJECTIVE #2

Boot-up and load the CAD software.

OBJECTIVE #3

Create a simple drawing using the CAD system.

OBJECTIVE #4

Execute the save and end commands to exit from the CAD system.

OBJECTIVE #5

Execute basic maintenance tasks with the file disk (i.e. format, copy, erase, etc.).

UNIT - GEOMETRIC CONSTRUCTION

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will demonstrate the ability to:

1. identify various geometric shapes, lines, arcs, angles, and tangents;
2. construct various geometric shapes, lines, arcs, angles, and tangents;
3. construct a drawing using several geometric shapes and drawing methods;
4. produce various geometric shapes, lines, arcs, angles and tangents on a CAD system.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Drafting Textbooks

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify a set of geometric shapes, lines, arcs, angles, and tangents.

OBJECTIVE #2

Construct various types of geometric shapes, lines, arcs, angles, and tangents.

OBJECTIVE #3

Construct a one-view drawing which will contain a number of different geometric shapes, lines, arcs, angles, and tangents.

OBJECTIVE #4

If a CAD system is available, the student will demonstrate their ability to produce a number of geometric shapes, lines, arcs, angles, and tangents.

UNIT - SINGLE VIEW LAYOUTS

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to use drafting tools to perform drawing tasks using a combination of lines, arcs, and circles;
2. demonstrate the ability to use drafting tools to perform drawing tasks using methods of geometric construction;
3. demonstrate the ability to measure using the full, half, and quarter scales, as well as other appropriate scales.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)
Appropriate drafting problems for single view layout

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given the appropriate resources, the student will complete a number of drawing tasks using lines, arcs, and circles.

OBJECTIVE #2

Given the appropriate resources, the student will complete a number of drawing tasks by using methods of geometric construction to draw parallels, perpendiculars, tangents, etc.

OBJECTIVE #3

Given the appropriate resources, the student will complete a number of drawing tasks to an assigned scale.

UNIT - ORTHOGRAPHIC PROJECTION

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to visualize objects in the six principle planes using third-angle orthographic projection;
2. demonstrate the ability to center single and multiple view drawings;
3. demonstrate the ability to select and draw only the necessary views describing an object;
4. demonstrate the ability to correctly arrange multiview drawings;
5. demonstrate the ability to project features using common projection methods.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify the correct missing view of a given object from a group of different views.

OBJECTIVE #2

Properly center a multiview object on drawing paper or on CAD.

OBJECTIVE #3

Choose and draw the necessary views of a given object on drawing paper or on CAD.

OBJECTIVE #4

Properly arrange the views of a given object on drawing paper or on CAD.

OBJECTIVE #5

Correctly project hidden surfaces, angular surfaces, and cylindrical surfaces between views of a given object.

UNIT - DIMENSIONING

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. apply metric and inch size dimensions to single and multi-view drawings according to the American National Standards (ANSI Y14.5);
2. apply metric and inch location dimensions to single and multi-view drawings according to ANSI Y14.5. drawings;
3. apply local and general notes to single and multi-view drawings according to ANSI standards;
4. apply National and International symbols to single and multi-view drawings according to ANSI Y14.5.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Dimension a single or multi-view drawing with metric or inch size dimensions following procedures set forth in ANSI Y14.5.

OBJECTIVE #2

Dimension a single or multi-view drawing with metric or inch size dimensions following procedures in ANSI Y14.5.

OBJECTIVE #3

Label local and general notes on single or multi-view drawings following procedures in ANSI standards.

OBJECTIVE #4

Apply National or International symbols on single or multi-view drawings following ANSI Y14.5 standards.

UNIT - SECTIONAL VIEWS

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. define the theory and use of sectional views;
2. list and identify the following sectional views: full, half, broken out, offset, revolved, and removed;
3. list and draw each of the lines used in sectional drawings;
4. using orthographic projection, draw a full and half section.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Drafting texts
Models

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Students will list the reasons for including sectional views in their drawings.

OBJECTIVE #2

From a given list of sectional drawings, students will identify each of the sectional views used: full, half, broken out (partial), offset, revolved, and removed.

OBJECTIVE #3

Students will identify each of the lines that are used in sectional views and explain their purpose.

OBJECTIVE #4

Students will complete two drawings illustrating sectional views either manually or on CAD. One drawing should include a full section and the other a half section.

UNIT - PICTORIAL - ISOMETRICS AND OBLIQUES

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. list three applications of pictorial drawings that demonstrate their unique characteristics in the field of drafting;
2. identify three common types of pictorial drawings - perspective, isometric and oblique;
3. create an isometric drawing;
4. create an oblique drawing;
5. using a CAD system, draft an isometric and oblique drawing.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Texts
Models

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Students will list three applications of pictorial drawings and explain, in writing, why they are necessary.

OBJECTIVE #2

From a list containing a variety of pictorial drawings, the student will identify each particular type of pictorial drawing.

OBJECTIVE #3

Given the appropriate drafting resources, the student will make an isometric drawing using the isometric axes and construct a four-center ellipse.

OBJECTIVE #4

Given the appropriate drafting resources, the student will make an oblique drawing.

OBJECTIVE #5

Using a CAD system and given the appropriate drafting resources, the student will make an isometric drawing.

UNIT - AUXILIARIES

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. define the uses of an auxiliary view;
2. demonstrate the ability to distinguish between the principal auxiliary view of an object;
3. construct primary auxiliary view containing a plotted curve;
4. list the advantages of a CAD system in creating auxiliary vies and define the difference between primary and secondary auxiliary function on a CAD system.

LEARNING ACTIVITIES

Demonstration/group projects/student performance/lecture

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
3-D models
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given a series of definitions the student will be able to select the correct definition of an auxiliary plane.

OBJECTIVE #2

Given a set of drawings, students will identify the principal auxiliary views.

OBJECTIVE #3

Given the proper drafting resources, the student will draw a primary auxiliary view.

OBJECTIVE #4

Given a view on a CRT, the student will be able to identify it as either a normal view or an auxiliary view.

UNIT - DRAWING REPRODUCTION AND STORAGE

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to identify the various types of tracing medium including paper, vellum, and film;
2. demonstrate the ability to identify the proper tools to be used with the various tracing media, i.e., lead, polymer leads, ink;
3. demonstrate the ability to identify the types of copies and copiers used in the drafting trade;
4. demonstrate the ability to identify and use the various methods of drawing reproduction;
5. describe different methods of drawing storage and accessing drawing information from storage, including paper storage, microfiche, aperture cards, and computer storage systems.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Tracing media samples
Drafting tools, leads, and inks
Reproduction equipment
Samples of reproduced/copied materials
Visual aids

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given the proper samples of drafting and tracing media, the student will identify the various types of tracing media including paper, vellum, and film by name.

OBJECTIVE #2

Given a selection of drafting tools, the student will identify the proper tools to be used with the various tracing media such as leads, polymer leads, and inks.

OBJECTIVE #3

The student will identify the types of copiers used in the drafting trade which are used to create a set of sample reproductions or copies and describe the processes involved.

OBJECTIVE #4

The student will demonstrate the ability to trace a given drawing and reproduce it using one of the accepted methods or processes.

OBJECTIVE #5

The student will describe the different processes used to store drawn information and access this information from storage.

UNIT - GRAPHS AND CHARTS

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to identify a bar graph, pie graph, and a histogram, and retrieve facts from each;
2. demonstrate the ability to graphically illustrate a set of facts using a graph;
3. demonstrate the ability to identify and use a flowchart to show a sequential process.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Sample charts and graphs
Drafting instruments
Drafting equipment
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given a sample of each type of graph, the student will name each type and retrieve facts from each.

OBJECTIVE #2

Given a set of facts for each type of graph, the student will select and develop the appropriate graph to demonstrate the given facts.

OBJECTIVE #3

Given a sequential operation or process, the student will develop a flowchart to show the steps of this operation.

UNIT - DEVELOPMENTS

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. distinguish between a radial line development and a parallel line development;
2. demonstrate the ability to construct a parallel line development of a rectangular prism;
3. demonstrate the ability to construct a parallel line development of a cylinder;
4. demonstrate the ability to construct a radial line development of a pyramid;
5. demonstrate the ability to construct a radial line development of a cone;
6. relate to products of industry which incorporate the use of developments.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

Given the appropriate drafting resources, the student will demonstrate the following competency level:

OBJECTIVE #1

Select the difference between a radial line and a parallel line development from a number of examples.

OBJECTIVE #2

Develop a parallel line stretch-out of a rectangular prism.

OBJECTIVE #3

Develop a parallel line stretch-out of a cylinder.

OBJECTIVE #4

Develop a radial line stretch-out of a pyramid.

OBJECTIVE #5

Develop a radial line stretch-out of a cone.

OBJECTIVE #6

List a number of products made in industry using parallel line and radial line developments.

UNIT - DRAFTING TOOLS

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to use and operate the tools available to manually draw lines, arcs, curves, and circles;
2. demonstrate the ability to measure and transfer measurements using available tools;
3. demonstrate the ability to letter and use standardized symbols;
4. demonstrate the ability to modify a drawing on different mediums by erasing;
5. demonstrate the ability to use the available tools to reduce and enlarge a drawing;
6. demonstrate the ability to produce a drawing on a CAD system if available.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
CAD system

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

using the available traditional tools, the student will create lines, arcs, curves, and circles.

OBJECTIVE #2

using the available measuring tools and drafting instruments, the student will define distance;s, transfer and repeat measurements, and use scales to enlarge or reduce sizes.

OBJECTIVE #3

The student will use available methods to produce hand lettering, templated lettering, and automated lettering, if available, as well as creating standardized symbols manually or by template.

OBJECTIVE #4

The student will modify a drawing by using the proper erasing methods for a selected drafting medium, such as lead on paper or vellum or ink on film.

OBJECTIVE #5

The student will use various means to enlarge or reduce an object including graph paper, scaling, proportional dividers or pantograph if available.

OBJECTIVE #6

If a CAD system is available, the student will demonstrate his proficiency on the system by producing a number of drawings. These drawings should use and demonstrate as many of the resident commands as possible, to their best advantage.

UNIT - SKETCHING

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. sketch proportionate pictorial drawings from three-view drawings without the aid of graph paper;
2. sketch the six principle orthographic views;
3. use sketching as a means to clarify thinking and communicate ideas before drawings are started.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Pencils
White paper
Graph paper, iso grid paper
Drafting texts Drafting (CAD)
Drafting instruments

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given three view drawings, students will sketch pictorial drawings without the aid of graph paper.

OBJECTIVE #2

Given three view drawings, students will sketch each of the six principle views without the aid of graph paper.

OBJECTIVE #3

Given the appropriate resources, students will solve drafting problems and communicate their results with sketching before they use tools to complete the drawing.

UNIT - DIMENSIONING AND TOLERANCING

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. apply size and location dimensions, symbols, and labels to working drawings using either the aligned or unidirectional methods according to industrial standards such as ANSI Y14.5 and ISO standards;
2. identify and apply the dimensioning and tolerancing methods used on drawings such as limit, and plus and minus dimensioning.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Text and Reference Material

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Apply dimensions, symbols, and labels to working drawings according to industrial standards.

OBJECTIVE #2

Apply dimensional tolerances to machine parts and features using either limit dimensions or plus and minus dimensions according to industrial standards.

UNIT - ORTHOGRAPHIC PROJECTION

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to select and draw the necessary views of an object in orthographic projection, and arrange the views in correct relationship to each other;
2. distinguish between first angle projection and third angle projection of multiview drawings;
3. demonstrate the ability to use projection methods and/or the reference plane line method of projection rectangular, angular, and curved surfaces of multiview drawings;
4. demonstrate the ability to label points and surfaces in any of the principle planes of projection.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Text and Reference Material

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Select and draw the necessary views to clearly identify an object using orthographic projection.

OBJECTIVE #2

Given a multiview drawing, the student will properly select the method of projection (1st or 3rd angle projection).

OBJECTIVE #3

Use a method of projection to transfer rectangular, angular or curved surfaces of an object between views.

OBJECTIVE #4

Label points and/or surfaces in the principle planes of projection in multiview drawings.

UNIT - SECTIONING

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. list and identify the following sectional views: full, half, broken out, offset, revolved, removed, thin section, and phantom;
2. demonstrate how sectional views depict ribs and webs;
3. demonstrate how sectional views depict shafts, bolts, and rivets;
4. draw an offset section;
5. draw a broken out section;
6. draw a revolved section;
7. draw a removed section;
8. draw a thin section;
9. draw a phantom section;
10. draw section lines for the following materials: cast iron, steel, bronze- brass- copper, white metal- zinc- lead- babbitt- alloys, magnesium- aluminum- alloys and wood grain.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Drafting texts

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

From a given list of sectional drawings, students will identify each sectional view. This list includes full, half, broken out, offset, revolved, removed, thin section and phantom.

OBJECTIVES #2,3

In conjunction with the following sectional drawings, ribs, webs, shafts, bolts, and rivets will be included. Also, at least one of the following drawings should be drawn using a CAD system.

OBJECTIVES #4-9

Given the appropriate resources, students will draw each of the following sectional views: broken out, offset, revolved, removed, thin section and phantom.

OBJECTIVE #10

Students will create a drawing that will depict the following materials in sectional views: cast iron, steel, bronze- brass- copper, white metal- zinc- lead- babbitt- alloys, magnesium- aluminum- aluminum alloys and wood grain.

UNIT - AUXILIARIES

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to define the use of successive auxiliary views;
2. demonstrate the ability to distinguish between primary and successive auxiliary views;
3. demonstrate the ability to construct successive auxiliary views of an object;
4. list the advantages of a CAD system in creating successive auxiliary views;
5. create a successive auxiliary view of a CAD system.

LEARNING ACTIVITIES

Demonstration/group, projects/student,
performance/lecture/slides

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
A.V. equipment
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given a series of definitions the student will be able to select the correct definition of a successive auxiliary view.

OBJECTIVE #2

Given a set of drawings, the student will identify the primary and secondary auxiliary views.

OBJECTIVE #3

Draw a series of successive auxiliary views of an object.

OBJECTIVE #4

Create a list of the advantages of using a CAD system to create auxiliary views of an object.

OBJECTIVE #5

Create successive auxiliary vies by use of a CAD system.

UNIT - PICTORIAL - ISOMETRIC AND OBLIQUE VIEWS

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. draw various pictorial representations including isometric and oblique drawings;
2. draw oblique pictorials in cavalier and cabinet style of any given object;
3. choose the proper view to be used as the front view in the oblique pictorials to be illustrated;
4. draw circles and arcs in an oblique pictorial;
5. shade a pictorial drawing to give it contrast and depth using pencil, color or air brush;
6. draw a pictorial using a reverse angle.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)
Appropriate drafting problems for pictorial representation.

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given an assigned project, the student will produce a set of pictorials including an isometric and oblique representation of the object.

OBJECTIVE #2

Given an assigned project, the student will develop the cavalier and cabinet oblique of that object.

OBJECTIVE #3

Given a set of objects, the student will select the proper direction to view and draw the oblique representations of those objects.

OBJECTIVE #4

Given a problem containing circles and/or arcs, the student will draw the oblique representation of the object.

OBJECTIVE #5

After completing any given pictorial, the student will shade or render the object using an identifiable light source to accentuate the shapes and surfaces of the object.

OBJECTIVE #6

Prepare a given pictorial using a reverse angle.

UNIT - FASTENERS

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. identify common types of mechanical fasteners used on drawings (cap screws, nuts, washers, pins, etc.);
2. recognize different ways of representing screw threads on detailed and assembly drawings (simplified, schematic, and detailed);
3. explain the local notes attached to fasteners found on detailed and assembly drawings;
4. use reference book tables and/or ANSI standards to identify common inch and metric sizes of mechanical fasteners found on drawings;
5. demonstrate the ability to draw (manually or on CAD) common threaded fasteners, both internal and external, using the simplified method of representation.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Texts, reference books, and industrial standards.

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify common mechanical fasteners found on detailed and assembly drawing by their shape and note description.

OBJECTIVE #2

Identify the three types of thread representation found on detailed and assembly drawings with threaded fasteners.

OBJECTIVE #3

List the definitions associated with the local notes attached to both inch and metric mechanical fasteners.

OBJECTIVE #4

Locate size and shape information about inch and metric mechanical fasteners found in reference tables.

OBJECTIVE #5

Draw and label (manually or on CAD) local notes for common mechanical fasteners using the simplified method of representation.

UNIT - MECHANICAL DRIVE SYSTEMS

LEVEL - INTERMEDIATE AND ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to identify various type of gears and gear drive systems;
2. demonstrate the ability to identify the different parts of a gear and draw a set of teeth of a sample gear;
3. demonstrate the ability to identify the different types of cam motion used in common cam design;
4. demonstrate the ability to draw a cam to a set of predetermined specifications and motions;
5. identify the effect a combination of gears, cams and levers will have on an original motion;
6. demonstrate the ability to construct models of mechanical drives and drive applications using an appropriate component modeling set.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)
Sample gears, cams, and levers
Lego Systems Technical Package or similar construction set

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given samples or illustrations of various gears and cams, the student will identify each by proper name and explain how it is used in a drive system.

OBJECTIVE #2

Given samples or illustrations of various gears, the student will identify the various parts of the gear and then draw a set of teeth of an assigned gear.

OBJECTIVE #3

Given a set of illustrations of cams, the student will identify each and then interpret a set of cam specifications and draw the resulting cam.

OBJECTIVE #4

Given a set of cam specifications and desired motions, the student will develop the resulting cam.

OBJECTIVE #5

Given a set of mechanical drive illustrations, the student will determine the motions created in the illustration.

OBJECTIVE #6

Given a LEGO TECH Construction set or a similar construction set, the student will assemble the available pieces to create desired motions and mechanically advantaged assemblies.

UNIT - FLOOR PLAN DESIGN

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. determine furniture relationship to room size;
2. determine residential room configurations;
3. determine relationship of rooms to each other;
4. demonstrate the ability to properly dimension floor plans.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Develop floor plans of various rooms indicating furniture placement.

OBJECTIVE #2

Develop workable room plans.

OBJECTIVE #3

Develop a workable floor plan for a residence.

OBJECTIVE #4

Dimension a floor plan.

UNIT - FRAME MEMBER SIZING

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to calculate live and dead loads on floors and roof;
2. demonstrate the ability to select the correct size and spacing of floor and roof structural members.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Calculate live and dead loads.

OBJECTIVE #2

Determine size and spacing of structural members using the previously calculated loads.

UNIT - FOUNDATION CONFIGURATION

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to determine foundation and footing sizes;
2. demonstrate the ability to dimension foundations and footings.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Develop a foundation plan utilizing correct calculations for foundation and footing design.

OBJECTIVE #2

Dimension a foundation plan, including footing details.

UNIT - STAIR LAYOUT

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to understand stair terminology;
2. demonstrate the ability to calculate stair sizes;
3. identify different type of stair layouts.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Correctly identify parts of a stair.

OBJECTIVE #2

Fully calculate the design of a staircase and its components.

OBJECTIVE #3

Given a set of drawings, identify the different types of stair layouts that are used.

UNIT - WINDOW AND DOOR SCHEDULES

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. determine proper window sizes for specific residential applications;
2. determine proper door sizes for specific residential applications;
3. demonstrate the ability to develop a complete and accurate window schedule;
4. demonstrate the ability to develop a complete and accurate door schedule;
5. demonstrate the ability to identify the various window types and applications;
6. demonstrate the ability to identify the various door types;
7. demonstrate the ability to detail windows and doors.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Select the proper window sizes for a residence.

OBJECTIVE #2

Properly determine door sizes for a residence.

OBJECTIVE #3

Develop a residential window schedule.

OBJECTIVE #4

Develop a residential door schedule.

OBJECTIVE #5

List and identify various window types.

OBJECTIVE #6

List and identify various door types.

OBJECTIVE #7

Properly develop window and door details.

UNIT - SECTIONING

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to develop a full cross section of a single story residence;
2. demonstrate the ability to develop foundation sections;
3. demonstrate the ability to develop a typical wall section;
4. demonstrate the ability to use section marks.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Develop a cross-section of a single-story residence.

OBJECTIVE #2

Develop a foundation section for a residence.

OBJECTIVE #3

Develop a typical wall section for a residence.

OBJECTIVE #4

Properly use section marks, in both plan and section.

UNIT - ELEVATIONS

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to develop an elevation;
2. demonstrate the ability to label an elevation;
3. demonstrate the ability to properly dimension elevations.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1
Develop an elevation of a residence.

OBJECTIVE #2
Properly label said residence.

OBJECTIVE #3
Dimension an elevation.

UNIT - PICTORIALS - PERSPECTIVES

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. understand the purposes for which perspectives are used;
2. develop and draw a one-point perspective;
3. develop and draw a two-point perspective.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

List the purposes for perspective drawings.

OBJECTIVE #2

Develop a one-point perspective of a kitchen.

OBJECTIVE #3

Develop a two-point perspective of a residence.

UNIT - PLOT PLAN

LEVEL - INTRODUCTORY

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to properly orientate a home on a site;
2. demonstrate the ability to properly dimension a plot plan;
3. demonstrate the ability to give thoughtful consideration to landscaping, building, and zoning codes, utilities, and topography in planning and designing the site.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

The student will properly orientate a house on a given site.

OBJECTIVE #2

The student will dimension a plot plan.

OBJECTIVE #3

The student will draw a plot plan with consideration of building and zoning code, landscaping, utilities, and topography.

UNIT - ENERGY EFFICIENCY

LEVEL - INTERMEDIATE

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to orient a structure to a site considering solar advantages;
2. demonstrate the ability to consider R-values in construction.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Properly orient a structure to a site.

OBJECTIVE #2

Design and draw a typical wall section that has a total R-value of 19 or greater.

UNIT - DIMENSIONING AND TOLERANCING

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. identify and apply application methods for dimensioning such as: rectangular coordinate, polar coordinate, datum, tabular dimensioning and general default tolerance notes;
2. define and apply limits and fits symbols, both inch and metric systems, to working drawings according to industrial standards;
3. define and apply standard symbols and abbreviations to working drawings according to industrial standards.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Text and reference material

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Apply size and location dimensions to working drawings using one of the following methods: rectangular coordinate, polar coordinate, tabular, or datum dimensioning.

OBJECTIVE #2

Apply tolerances and fits to mating parts according to their function using standard industrial fits.

OBJECTIVE #3

Apply standard abbreviations and symbols to working drawings in accordance with industrial standards.

UNIT - THREADS AND FASTENERS

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. identify common screw thread forms such as: Unified, Acme, Square, Buttress, and Knuckle;
2. define thread designations for Unified inch, ISO metric, and National Pipe threads (.25-20 UNC-2A, M16x1.5-6g, 4 x 8NPT);
3. recognize and categorize common mechanical fasteners such as: machine screws, cap screws, set screws, wood screws, bolts, nuts, washers, and self-tap screws;
4. demonstrate the ability to use reference tables, such as ISO standards and ANSI standards, to determine sizes and characteristics of mechanical fasteners;
5. demonstrate the ability to draw and label (manually or in CAD) common screw thread forms using the Detailed, Schematic and Simplified methods of representation on drawings;
6. demonstrate the ability to draw and label (manually or in CAD) miscellaneous fasteners such as keys, pins, retaining rings, and springs on detailed and assembly drawings;
7. demonstrate the ability to make a fastener for the symbol library on CAD.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Texts, reference books, and industrial standards
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify common screw thread forms found on detailed and assembly drawings by their shape characteristics.

OBJECTIVE #2

Define thread designations on drawings for Unified inch series, ISO metric threads, and National Pipe threads.

OBJECTIVE #3

Categorize common mechanical fasteners by their shape characteristics, type, and size.

OBJECTIVE #4

Use reference tables from texts, and/or industrial standards, to determine size and characteristics of mechanical fasteners.

OBJECTIVE #5

Draw and label (manually or on CAD) common screw thread forms using the detailed, schematic and simplified methods of representations.

OBJECTIVE #6

Draw and label (manually or on CAD) miscellaneous fasteners such as keys, pins, retaining rings, and springs on detailed and assembly drawings.

OBJECTIVE #7

Draw a fastener to be used for the symbol library on CAD.

UNIT - PRODUCTION ILLUSTRATION

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. identify each of the following types of rendering styles for technical illustration: shading, stipple, airbrush, applique shading and ruled surface shading;
2. demonstrate at least three different rendering styles on pictorial drawings;
3. clarify thinking and communicate ideas by sketching a layout of an exploded view drawing containing at least 4-5 parts;
4. draw an exploded view drawing.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Pencils
White paper
Graph paper, ISO grid paper
Drafting text
Drafting instruments
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

From examples provided, students will identify each of the following types of rendering styles for technical illustration: shading, stipple, airbrush, applique shading and ruled surface shading.

OBJECTIVE #2

Given the appropriate resources, students will draw three pictorial drawings and demonstrate a different rendering style for each.

OBJECTIVE #3

Given the appropriate resources, students will clarify thinking and communicate ideas by sketching a layout of an exploded view drawing containing at least 4-5 parts.

OBJECTIVE #4

Students, using their layout sketches, will draw an exploded view drawing using CAD or conventional drafting tools.

UNIT - PICTORIALS - PERSPECTIVES

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. identify the components needed to produce a single point perspective drawing of any object;
2. identify the components needed to execute a two-point perspective drawing of any given object;
3. identify the three different types of views possible when using perspective drawing;
4. demonstrate the effect different placements of the three key lines (picture plane, ground line, and horizon) and the station point have on the end product when working with perspective drawings;
5. draw a single-point perspective of a given object;
6. draw a two-point perspective of a given object;
7. draw a perspective which contains circular or irregular shapes;
8. shade or render a perspective drawing using pencil, color, or airbrush.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Drafting textbooks
Computer-Aided Drafting (CAD)
Appropriate drafting problems for pictorial representation.

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Given samples of single-point perspectives, the student will identify the critical components of each drawing and label each part using its proper name.

OBJECTIVE #2

Given samples of two-point perspectives, the student will identify the critical components of each drawing and label each part using its proper name.

OBJECTIVE #3

Given samples of single- and two-point perspectives, the student will identify the types of views produced including worm's eye, man's eye, and bird's eye views.

OBJECTIVE #4

Using any given shape, the student will prepare different perspective drawings using varying placements of the components to produce different representations of the same object.

OBJECTIVE #5

Given an object, the student will prepare a single-point perspective of that object.

OBJECTIVE #6

Given an object, the student will prepare a two-point perspective of that object.

OBJECTIVE #7

Given an object which contains circular or irregular shapes, the student will prepare a single- and two-point perspective of that object.

OBJECTIVE #8

After preparing a perspective of an object, the student will shade or render the object to give it more depth and aesthetic appeal.

UNIT - REVOLUTIONS

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. visualize and object which revolves about an axis perpendicular to a front plane;
2. construct an object which revolves about an axis perpendicular to a top plane;
3. construct an object which involves successive rotation;
4. produce a revolved drawing on a CAD system if available.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Identify lines and surfaces in the revolved view which have been projected from the primary views.

OBJECTIVE #2

Draw a revolved drawing of a simple object which is revolved about an axis perpendicular to a top plane.

OBJECTIVE #3

Construct a drawing dealing with successive rotation. Use the results of drawing 2 as the starting point for this drawing.

OBJECTIVE #4

Construct a series of revolved drawings on a CAD system using the appropriate commands.

UNIT - DEVELOPMENTS AND INTERSECTIONS

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to layout and construct prisms and cylinders by the parallel line development method;
2. demonstrate the ability to lay out and construct flat and conical surfaces by the radial line development method;
3. demonstrate the ability to lay out and construct transition pieces by the triangulation method;
4. demonstrate the ability to plot lines of intersection between two intersecting prisms;
5. demonstrate the ability to lay out and construct the developments of two intersecting prisms.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
Texts and reference materials.

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Lay out and construct prisms and cylinders using the parallel line development method.

OBJECTIVE #2

Lay out and construct flat and conical surfaces using the radial line development method.

OBJECTIVE #3

Lay out and construct transition pieces by the triangulation method.

OBJECTIVE #4

Plot lines of intersection on a multiview drawing to determine the extents of two intersecting prisms.

OBJECTIVE #5

Layout and construct the developments of two intersecting prisms.

UNIT - DESCRIPTIVE GEOMETRY

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. demonstrate the ability to use (manually or on CAD) the reference plane line method with labels to aid in projecting graphic solutions;
2. demonstrate the ability to define (manually or on CAD) true distances, true lengths, and true angles using the auxiliary view method of projection;
3. demonstrate the ability to define (manually or on CAD) true lengths and surfaces using the revolution method;
4. demonstrate the ability to define (manually or on CAD) points of intersection between lines and/or surfaces;
5. demonstrate the ability to determine (manually or on CAD) the bearing and/or slope of a line.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)
texts and reference materials

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Draw and label (manually or on CAD) a multiview drawing using the reference plane line method.

OBJECTIVE #2

Using the reference plane line method and auxiliary view projection, determine (manually or on CAD) the graphic solutions for the following: true length of a line, true surface of a plane, and the true angle between two lines.

OBJECTIVE #3

Determine (manually or on CAD) the true length of a line and/or surface using the revolution method.

OBJECTIVE #4

Determine graphically (manually or on CAD) the point of intersection between two lines and/or surfaces.

OBJECTIVE #5

Determine graphically (manually or on CAD) the bearing and/or slope of a line.

UNIT - SPECIALIZED FIELDS OF DRAFTING

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. identify different types of welds and the symbols associated with each type;
2. identify symbols found on topographic maps;
3. identify the major components of a single line electrical diagram;
4. understand the different types of career opportunities within the aviation industry dealing with aircraft design.

LEARNING ACTIVITIES

Lecture/demonstration/student performance

AVAILABLE RESOURCES NEEDED

Drafting instruments
Drafting equipment
Drafting supplies
Computer-Aided Drafting (CAD)

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Using an available drawing, the student will identify the welding symbols used on the drawing.

OBJECTIVE #2

Using a topographic map, the student will identify the common natural surface symbols.

OBJECTIVE #3

From a simple sketch of an electrical diagram, the student will layout a single line diagram showing all major parts of the circuit according to ANSI standards.

OBJECTIVE #4

The student will choose two careers in the aircraft design industry and develop a report on each.

UNIT - MODELING AND MODEL MAKING

LEVEL - ADVANCED

TIME -

OBJECTIVES: The students will be able to:

1. build a scale model prototype of a mechanical design that will be useful in communicating the design more fully, using cut-a-way sections where necessary;
2. build a scale model of a house showing cut-a-way sections of elevations;
3. construct a scale model of an architectural project such as an office building complex, factory complex, or shopping layout.

LEARNING ACTIVITIES

Student performance

AVAILABLE RESOURCES NEEDED

Shop equipment
Hand tools
Plastic materials, foam core, etc.

COMPETENCY TESTS

The student will demonstrate the following competency level:

OBJECTIVE #1

Build a full scale model or prototype of part using the same material as in production to test out the feasibility of the design.

OBJECTIVE #2

Using foam core, balsa wood, etc., build a scaled-down model of a house design with furniture, etc.

OBJECTIVE #3

Construct an architectural building layout showing landscaping ground cover buildings and topography.